

# Operating instructions



## Frequency control devices FS-16 / FS-18 for oscillating conveyor

Art. no.: 90.0210.50 FS-16

Art. no.: 90.0210.52 FS-18



**fimotec-fischer GmbH & Co. KG**  
Friedhofstraße 13  
D -78588 Denkingen

**Tel:** +49 (0)74 24 - 88 4-0  
**Fax:** +49 (0)74 24 - 88 4-50

**E-mail:** [post@fimotec.de](mailto:post@fimotec.de)  
**Internet:** [www.fimotec.de](http://www.fimotec.de)

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# Information and explanations

## Target group

These operating instructions will help you to use the described product safely and as intended.– **They are directed toward qualified skilled personnel\*.**





*Qualified personnel are people who have been authorized by persons responsible for the safety of the system to execute the required activities and are able to recognize potential dangers and avoid them based on their training, experience and instruction, as well as their knowledge of standards, regulations, accident prevention regulations and operating conditions (definition of skilled personnel according to IEC 364).*



- Read these operating instructions before you install the device, use it or carry out work on it.
- Also pass on these operating instructions to other users.

## Definition of the warnings and symbols

Warnings are indicated by danger symbols and signal words. The table shows what hazards and possible consequences the symbols, signal words and colours indicate.

Signal word	Definition	Consequences
 <b>GEFAHR</b>	Directly threatening danger	Death or extremely serious injuries
 <b>WARNUNG</b>	Dangerous situation	Potential death or extremely serious injuries
 <b>VORSICHT</b>	Dangerous situation	Minor to moderately serious injuries
<b>ACHTUNG</b>	Risk of property damage	Damage to the machine, its environment and the product
	Warnings can also have other warning signs: Example: Warning of electrical current! These symbols indicate the type of hazard.	

## Term definitions

Term	Definition
User	Persons who use the device installed by the manufacturer in its ready-to-use version.
Screen	Designation for the image visible within the touchscreen.
Button	Designation for key fields on the touchscreen
EMC	Electromagnetic compatibility with electrical and electromagnetic influences.
Skilled personnel	Qualified personnel with the appropriate education, training and experience.
Device	Designation (in these operating instructions) for the oscillating conveyor control unit FS-16/FS-18.
Machine manufacturer	Persons who install the device in the intended construction (machine) and who manufacture the ready-to-use version.
Menu	Designation for the structural layout of the user interface.
Touchscreen	Touch-sensitive screen (display) with operating function.

# Table of contents

<b>1</b>	<b>PRODUCT OVERVIEW .....</b>	<b>6</b>
1.1	Scope of delivery .....	6
1.2	Device versions .....	6
1.3	Available accessories, options .....	6
1.4	Properties .....	7
1.4.1	General .....	7
1.4.2	Output data .....	7
1.4.3	Inputs .....	7
1.4.4	Outputs .....	7
<b>2</b>	<b>SAFETY INFORMATION .....</b>	<b>8</b>
2.1	Intended use .....	8
2.2	Basic safety information .....	8
2.2.1	Transport and storage .....	8
<b>3</b>	<b>INSTALLATION .....</b>	<b>9</b>
3.1	Hardware installation .....	9
3.2	Mains connection .....	9
3.3	Oscillating conveyor connection .....	9
3.4	Fuse protection .....	9
<b>4</b>	<b>OPERATION .....</b>	<b>10</b>
4.1	Explanation of the button and display fields .....	10
4.2	Description of the user levels .....	11
4.2.1	Structure tree, main menu .....	11
	Structure tree, channel menus 1, 2 and 3 .....	12
4.2.2	Starting level .....	12
4.2.3	User level, channels 1, 2, 3 .....	13
4.2.4	User level status 1 .....	14
4.2.5	User level status 2 .....	15
4.2.6	User level status 3 .....	15
	Menu description .....	16
4.2.7	Main menu .....	16
4.2.8	Sensor menu .....	17
4.2.9	Oscillation amplitude sensor menu .....	18
4.2.10	Piece counter menu .....	19
4.2.11	Actuator menu .....	20
4.2.12	Enable menu .....	22
4.2.13	Password menu .....	22
4.2.14	Channel menu (CHANNEL MENU 1 / CHANNEL MENU 2 <sup>1</sup> / CHANNEL MENU 3 <sup>2</sup> ) .....	24
4.2.15	Ramp menu .....	25
4.3	Error display .....	25
4.3.1	Overtemperature .....	25
4.3.2	Current limit .....	25
4.3.3	No SW sensor connected .....	25
4.3.4	Current supply interruption .....	25
<b>5</b>	<b>DESCRIPTION OF CONTROL I/OS, FS-16 / FS-18 .....</b>	<b>26</b>
5.1	Operating status .....	26
5.2	Enable input .....	26
5.3	Sensor input .....	26

5.4	SW sensor input .....	26
5.5	Actuator output .....	27
<b>6</b>	<b>TECHNICAL DATA.....</b>	<b>28</b>
<b>7</b>	<b>TERMINAL ASSIGNMENTS .....</b>	<b>29</b>
7.1	Power connection assignments.....	29
<b>8</b>	<b>DIMENSIONS.....</b>	<b>30</b>
<b>9</b>	<b>MAINTENANCE AND CARE.....</b>	<b>30</b>
9.1	Regular tests .....	30
9.2	Decommissioning and disposal.....	30
<b>10</b>	<b>ACCESSORIES AND OPTIONS .....</b>	<b>31</b>
10.1	The plug connectors listed below are available as accessories: .....	31
10.2	The connection lines and oscillation amplitude sensor listed below are available as accessories: ....	31
<b>9</b>	<b>ACCESSORIES AND OPTIONS .....</b>	<b>31</b>

# 1 Product overview

## 1.1 Scope of delivery

- FS-16 / FS-18 control unit with software V1.0
- Operating instructions

## 1.2 Device versions

The FS-series devices are microprocessor-controlled, 1-phase frequency converters for sinusoidal actuation of consumers with variable frequency and amplitude.

## 1.3 Available accessories, options

- Oscillation amplitude sensor type: SWS-01

## **1.4 Properties**

### **1.4.1 General**

- Consumer output
- Parameterization via parameter blocks
- LCD touchscreen for operation
- Overcurrent limit for the consumer
- Mains input voltage monitoring
- Type of protection IP54

### **1.4.2 Output data**

Frequency range 15 Hz to 320 Hz

The frequency range is adjustable in steps of 0.1 Hz for all variants.

- Power adjustable from 0% to 100% in steps of 1%.
- Soft start ramp / soft stop ramp adjustable from 0 to 10 seconds
- Switch-on and -off delay in range from 0 to 60 seconds

### **1.4.3 Inputs**

- Enable input for switching on/off without power
- Sensor input with switch on/off delay in range from 0 to 60 seconds
- SW sensor input

### **1.4.4 Outputs**

- Operating notification relay contact 230 VAC / 6A (changeover contact).
- Consumer output for oscillating conveyor
- Actuator output +24 V DC
- Actuator output 230 V AC / 3 A only on FS-18

## 2 Safety information

### 2.1 Intended use

The FS-series devices are pieces of electrical equipment and are intended for use in supply mechanisms or automation systems. The devices are designed for the regulation and control of oscillating conveyor systems.


The electrical components listed here are called "devices" in the industrial parlance, but are not devices which can be used or connected or machines in the sense of the "Device safety law", the "EMC law" or the "EC Machinery Directive", but components. Only when these components are integrated in the construction of the machine manufacturer is the ultimate mode of operation defined.

The machine manufacturer is responsible for making sure that the construction meets the existing legal regulations.

### 2.2 Basic safety information

The following warnings both serve for the personal safety of the user as well as the safety of the described products and the devices connected to them.

Non-observance can lead to death, serious bodily injury or property damage.

	<p><b>Life-threatening danger due to electric shock!</b></p> <p>Even after the device is put out of operation by disconnecting the voltage, there is still dangerous electrical voltage on the internal circuit parts.</p> <ul style="list-style-type: none"> <li>– Disconnect the device from the supply voltage before any intervention.</li> <li>– Before opening the device, wait for at least 5 minutes until the residual voltage has dissipated.</li> <li>– Check to make sure there is no voltage before any intervention.</li> </ul>
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- Only skilled electricians may work on electrical equipment.
- Before commissioning, make sure that the voltage supply agrees with the nominal values of the device.
- Check the electrical equipment of the machine regularly. Deficiencies, such as loose connections, damaged or scorched lines, must be fixed immediately.
- Observe the valid accident prevention and safety regulations for your application.
- In particular, observe both the general and the regional installation and safety regulations for working with dangerous voltages (e.g. EN 50178) as well as the regulations having to do with the proper use of tools and the use of personal safety equipment.
- The Emergency Stop mechanisms must remain in effect in all operating modes. Unlocking the Emergency Stop mechanisms must not result in uncontrolled reactivation.

#### 2.2.1 Transport and storage

Problem-free and safe operation of this device require proper transport, storage, setup and installation, as well as careful operation and maintenance.

The device must be protected against mechanical impacts and vibrations during transport and storage. Protection against moisture, water and impermissible temperatures (see chapter 6 Technical data) must also be guaranteed.



### 3 Installation

#### ATTENTION

If the device is not correctly connected, this can lead to the failure or complete destruction of the device (and the connected load).

#### 3.1 Hardware installation

The FS-16 and FS-18 devices are designed for external installation (outside of a control cabinet) and have IP54 protection.

If the device is mounted on a mounting plate made of metal, it can be installed with its entire area in contact with the plate or with spacers. If the device is mounted to a thermally non-conductive surface, it is to be mounted at a distance of at least 10 mm from its surface.

#### 3.2 Mains connection

The mains must be connected according to the valid regulations.

It is connected via the attached Schuko "power" plug.

All touchable, electrically conductive housing parts must be grounded according to the valid regulations.

The connection must be made with at least a 1.0 mm<sup>2</sup> line cross-section.

#### 3.3 Oscillating conveyor connection

This is connected via the "X11" socket.

The pin assignments are as follows:

- Pin 1** Connection for load
- Pin 2** Connection for load
- PE** Connection for the ground protection conductor

The oscillating conveyors are connected to these connections.

#### 3.4 Fuse protection

The fuse protection on the primary side depends on the line cross-section. However, it must be designed to have a B6 line protection switch at minimum.

The devices are also protected with internal fuses.

#### Caution!:

Leakage currents against PE might occur due to EMC-related suppressor components. These are harmless, however, when an industry-standard RCD switch is used with a tripping current of 0.3 A.

## 4 Operation

The device is operated via a touchscreen. The corresponding function is executed by touching the respective field on the touchscreen with a finger or blunt object.

### 4.1 Explanation of the button and display fields

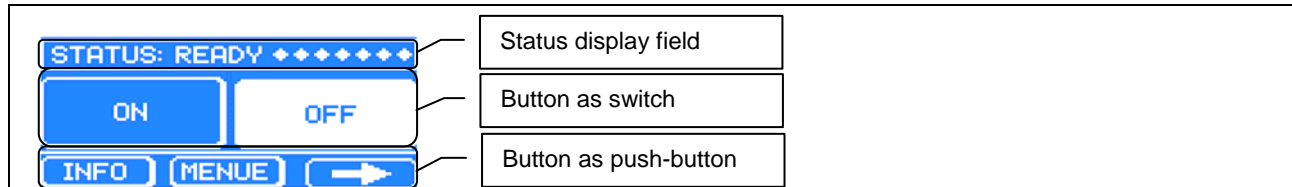


Figure 1: Screen description

Field	Definition
Status display field	In the status display field, the menu names and error messages are shown.
Button	<p>The term "button" designates the display field on the touchscreen, via which the displayed function is controlled.</p> <p><b>Function: Button as switch:</b></p> <ul style="list-style-type: none"> <li>– If the button is not actuated as a switch, this is shown with a blue background (see "ON" button in Figure 1).</li> <li>– If the button is actuated as a switch, this is shown with a white background (see "OFF" button in Figure 1).</li> </ul> <p>The button (as a switch) works with positive button pressure. That means that when the button is pushed by pressing on the touchscreen, the respective function is executed immediately.</p> <p><b>Function: Button as push-button:</b></p> <ul style="list-style-type: none"> <li>– If the button is not actuated as a push-button, this is shown with a blue background (see "INFO" and "MENU" buttons, Figure 1).</li> <li>– If the button is actuated as a push-button, this is shown as being "pressed" (shifted back) (see "⇒" button Figure 1).</li> </ul> <p>The button (as a push-button) works with negative button pressure. This means that when the button is pressed, the respective function is only executed when the button is released again.</p>

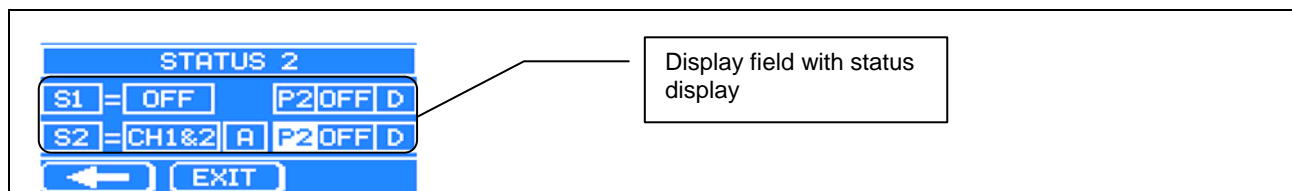


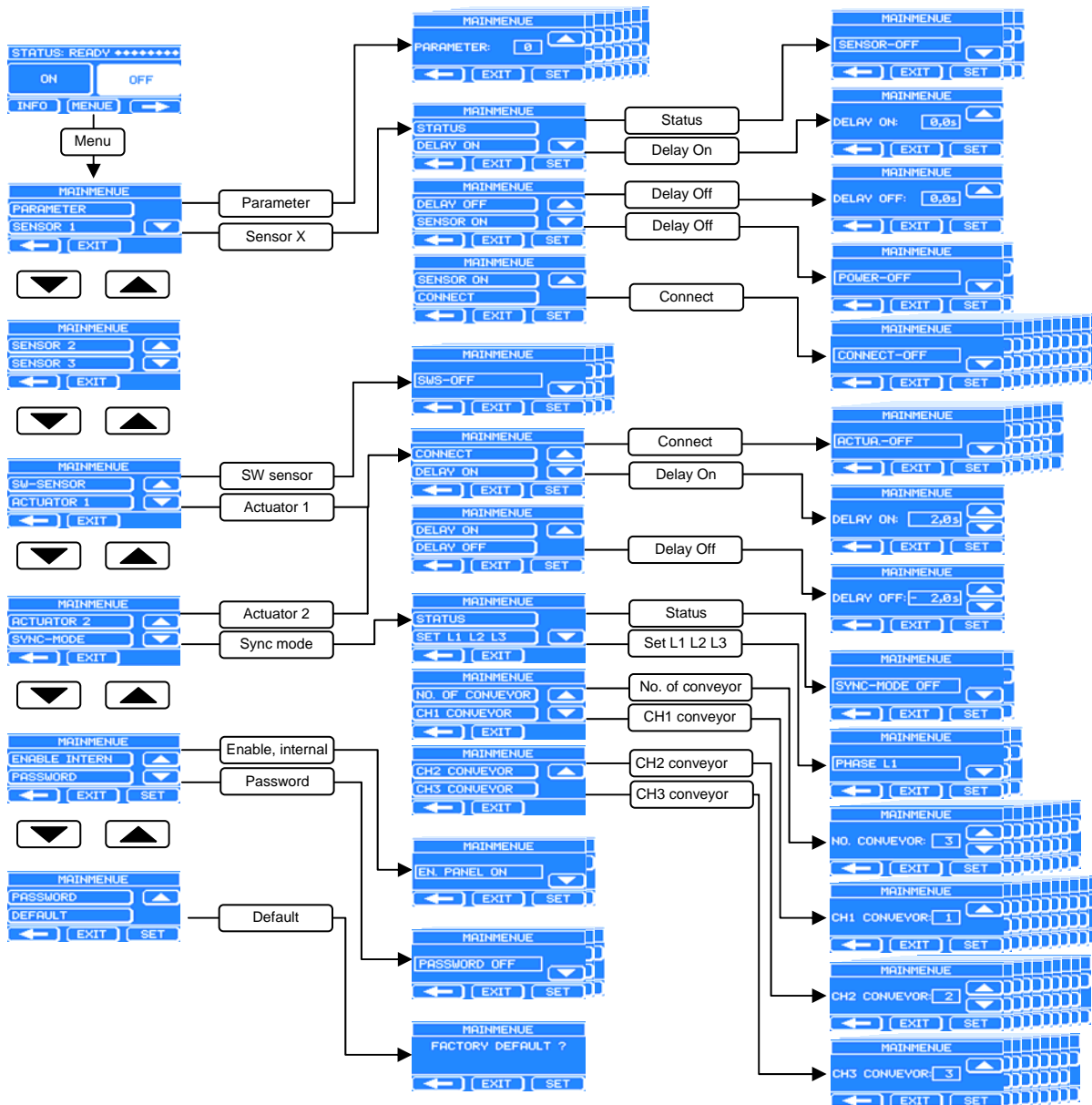
Figure 2 Display field with status display

Field	Definition
Display field with status display:	<p>In this display field, the current status of the respective parameter is visualized.</p> <ul style="list-style-type: none"> <li>– If the status is "inactive", the contents are shown with a blue background.</li> <li>– If the status is "active", the contents are shown with a white background.</li> </ul>

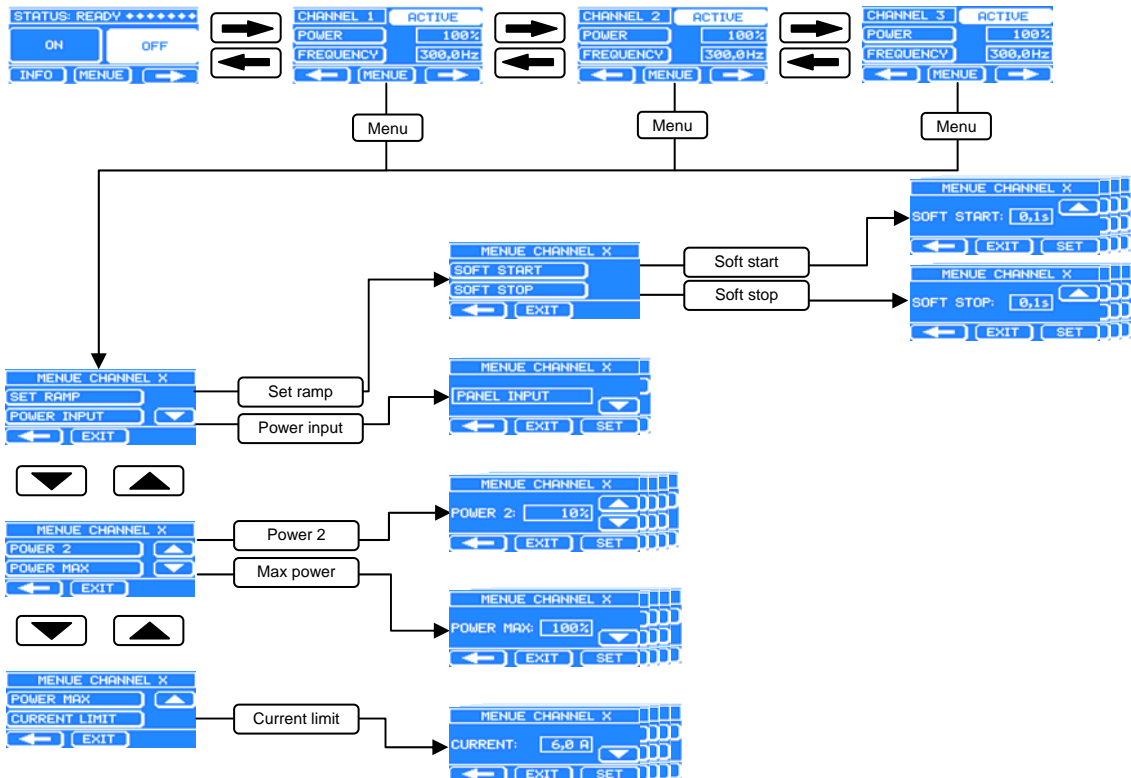
## 4.2 Description of the user levels

In this chapter, the different user levels will be shown and described.

### 4.2.1 Structure tree, main menu



## Structure tree, channel menus 1, 2 and 3



### 4.2.2 Starting level

On the starting level, the user can switch the FS-16/FS-18 on and off. The structure of this screen is described in Table 1.

Screen display	Description
	<b>Status bar:</b> The status bar shows the status of the FS-16/FS-18. <i>Display: Ready for operation</i>
	<b>Status bar:</b> The stars represent external input signals. <ul style="list-style-type: none"> <li>❖ External enable</li> <li>❖ Sensor 1</li> <li>❖ Sensor 2 <sup>*1</sup></li> <li>❖ Sensor 3 <sup>*2</sup></li> <li>❖ External parameter line Bit0</li> <li>❖ External parameter line Bit1</li> <li>❖ External parameter line Bit2</li> <li>❖ External parameter line SET</li> </ul>
	<b>ON/ OFF button:</b> The power outputs are activated via the ON button. The power outputs are deactivated via the OFF button. <i>Display: ON button not actuated, OFF button actuated</i>
	<b>INFO button:</b> Branching to the FS-16/FS-18 information screen. <b>MENUE button:</b> Branching to the main menu. <b>⇒ button:</b> Branching to the user levels.

Table 1: Starting level

### 4.2.3 User level, channels 1, 2, 3

The user levels channel 1, channel 2 and channel 3 are identically structured.

In the following Table 2, the structure is described based on the user level channel 1.

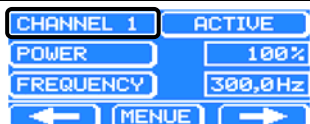



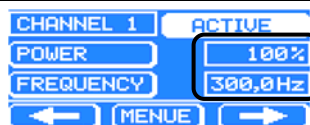

Screen display	Description
	<b>Display field:</b> Shows the name of the user level.
	<b>ACTIVE button:</b> Button for activating the channel. <i>Display: channel is not active</i>
	<b>ACTIVE button:</b> Button for activating the channel. <i>Display: channel is active</i>
	<b>POWER button:</b> Is branched to the screen for specifying the capacity. <b>FREQUENCY button:</b> Is branched to the screen for specifying the nominal frequency.
	<b>Display fields:</b> <b>0-100 %:</b> Display of the current capacity after enable signal. Display of the current nominal frequency <b>15-320 Hz:</b> Variant Solo/Duo channels 1 and 2 <b>15-320 Hz:</b> Variant Trio channel 1 <b>20-320 Hz:</b> Channels 2 and 3
	<b>⇐ button:</b> Branching to the previous level. <b>MENUE button:</b> Branching to the channel menu. <b>⇒ button:</b> Branching to the next level.

Table 2: Display of user levels channels 1, 2 and 3

#### 4.2.3.1 Capacity, nominal value specification

In this menu, the capacity can be set via the touchscreen.


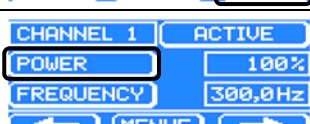


Screen display	Description
	Set the capacity: On the main screen, press the ⇒ button. – Press once to change channel 1. – Press twice to change channel 2. – Press three times to change channel 3.
	Now the screen shown on the left appears for channel 1, 2 or 3. Call up screen for the power: Press the POWER button.
	To increase power: Press or hold the △ button. To reduce power: Press or hold the ▽ button. <b>Attention:</b> If the maximum capacity "POWER MAX" is limited in the channel menu, this limit is the maximum for 100%. Then the following function applies: Capacity 0 - <=(POWER MAX) value.
	Once input has been made, the value is saved by pressing the SET button and the window is closed.

Table 3: Capacity nominal value specification menu

#### 4.2.3.2 Nominal frequency specification

In this menu, the nominal frequency can be set via the touchscreen.


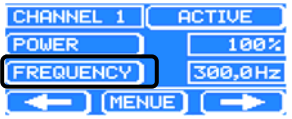
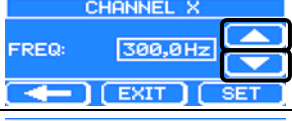
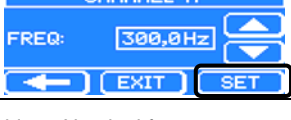
Screen display	Description
	Set nominal frequency: On the main screen, press the ⇨ button. – Press once to change channel 1. – Press twice to change channel 2. – Press three times to change channel 3.
	Now the screen shown on the left appears for channel 1. Call up screen for the frequency: Press the FREQUENCY button.
	Frequency increase: Press or hold the △ button. Frequency reduction: Press or hold the ▽ button. <i>Specification of the nominal frequency from 15/20 – 320 Hz; Resolution: Steps of 0.1 Hz.</i>
	Save nominal value: Pressing the SET button saves it. <i>The window will close.</i>

Table 4: Nominal frequency specification menu

#### 4.2.4 User level status 1

The "Status 1" screen shows the channel properties. The parameters are described in Table 5.

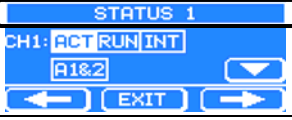

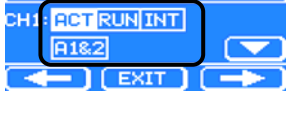
Screen display	Description
	<b>Display field:</b> Shows the name of the user level.
	<b>CH1:</b> Status display for channel 1
	<b>ACT:</b> Channel 1 activated/not activated. <i>Display: channel activated</i> <b>RUN:</b> RUN active/ RUN inactive. <i>Display: output not active</i> <b>INT/EXT</b> Capacity specification <i>Display: internal</i> INTERNAL/EXTERNAL. <b>A1/A2:</b> Link with actuator output. <i>Display: CH1 linked with actuators 1 and 2.</i>

Table 5: Display status 1

### 4.2.5 User level status 2

The "Status 2" screen shows the sensor links and settings. The structure of the "Status 2" screen is described in Table 6.






Screen display	Description		
	<b>Display field:</b> Shows the name of the user level.		
	<b>S1:</b>	Sensor status display	<i>Display:</i> S1-> Sensor1 Sensor not active
	<b>CH1, CH2<sup>*1</sup>, CH3<sup>*2</sup>, S1, S2<sup>*1</sup>, S3<sup>*2</sup>, A1, A2<sup>*2</sup></b>	Shows the link with sensor 1.	<i>Display:</i> Sensor 1 linked with channel 1 and actuator 1.
	<b>OFF, N.O., N.C.</b>	Sensor setting status	<i>Display:</i> Sensor 1 OFF (switched off)
	<b>P2</b>	Second nominal value spec.	<i>Display:</i> Power 2 active
	<b>D</b>	Time delay	<i>Display:</i> Time delay active
	<b>▽ button</b>	Branching to next sensor status <sup>*1,*2</sup>	
	<b>SWS</b>	Sensor status display	<i>Display:</i> SWS Sensor not active
	<b>OFF, CH1, CH2, CH3</b>	Indicates the assignment for the oscillation amplitude sensor	<i>Display:</i> Assignment channel 1
	<b>MIN, MAX</b>	Display for control range overshoot.	<i>Display:</i> Control range at maximum
	<b>↶ button:</b> <b>Exit button:</b>	Branching to the previous level. Branching to start screen.	

Table 6: Display status 2

### 4.2.6 User level status 3

The "Status 3" screen shows the operating hours counter and the piece counter. The structure of the "Status 3" screen is described in Table 7.



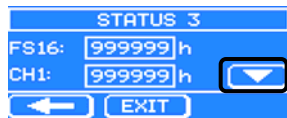


Screen display	Description		
	<b>Display field:</b> Shows the name of the user level.		
	<b>FS-16:</b>	Indicates the operating hours during which the device was switched on.	
	<b>CH1:</b>	Indicates the operating hours during which channel 1 was active.	
	<b>▽ button</b>	Branching to next level	
	<b>QUANTITY</b>	Indicates the total piece number that the sensor counted. Reset only possible in the main menu.	
	<b>QUANTITY</b>	Piece counter with reset function.	
	<b>↶ button:</b> <b>Exit button:</b>	Branching to the previous level. Branching to start screen.	

Table 7 Status 3 display

## Menu description

### 4.2.7 Main menu






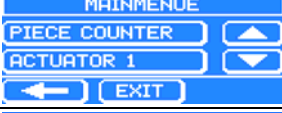
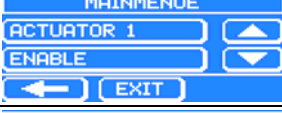
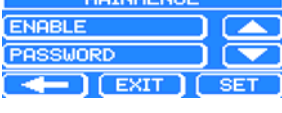



Screen display	Button	Screen display
	MENU	Call up the main menu: Press the MENU button.
	Parameter (PARAMETER)	 The FS-16/FS-18 has eight parameter blocks (0-7) in which different settings are stored and can be called up again.
	Sensor 1 (SENSOR 1)	For branching to sensor menu, see section 4.2.8.
	Oscillation amplitude sensor (SW SENSOR)	For branching to sensor menu, see section 4.2.9.
	Piece counter (PIECE COUNTER)	For branching to the piece counter menu, see section 4.2.10
	Actuator 1 (ACTUATOR 1)	For branching to actuator menu, see section 4.2.11.
	Enable (ENABLE)	For branching to enable menu, see section 4.2.12.
	Password (PASSWORD)	For branching to password menu, see section 4.2.13.
	Factory settings (DEFAULT)	 Query whether the current settings should <b>really</b> be reset to the factory settings.

Table 8: Main menu

#### 4.2.7.1 FS-16/ FS-18 (SW Sensor / Actuator 1)

A socket is available for the actuator and SW sensor of FS-16/FS-18.

The socket function can be defined via the main menu.


Screen display	Button	Screen display
	SW SENSOR ACTUATOR 1	

Table 9: SW Sensor / Actuator 1



#### 4.2.8 Sensor menu

The following Table 10 shows the structure.




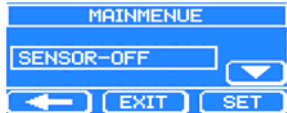
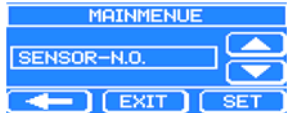
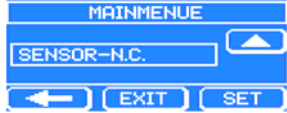
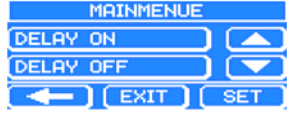

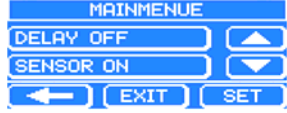

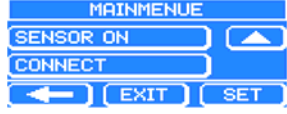
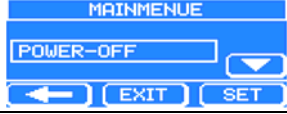


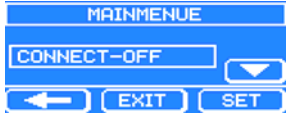

Screen display	Button	Screen display
	MENU	Press the MENU button.
	SENSOR 1	Press button ▽, until the desired sensor appears. Select the desired sensor
	Status (STATUS)	 Sensor input not active
		 Sensor input active Switching status N.O. "normally open", active when contact closed
		 Sensor input active Switching status N.C. "normally closed", active when contact open
	On delay (DELAY ON)	 On delay setting (setting range 0.0 s – 60.0 s)
	Off delay (DELAY OFF)	 Off delay setting (setting range 0.0 s – 60.0 s)
	Sensor is active (SENSOR ON)	 When the sensor is active, the power of the defined channel 1, channel 2 or channels 1&2 are reduced to zero.
		 When the sensor is active, the power from the defined channel 1, channel 2 or channels 1&2 are adapted to the specified setpoint 2.
	Link (CONNECT)	 Sensor X has a link.
		 Sensor X is linked with channel 1.

Table 10: Sensor menu

#### 4.2.9 Oscillation amplitude sensor menu

The following Table 11 shows the structure.





Screen display	Button	Screen display
	MENU	Press the MENU button.
	SW SENSOR <sup>2</sup>	Press the ▽ button until "SW SENSOR" appears. Press button, select SW sensor.
		 SW sensor not active.
		 SW sensor linked to channel 1

Table 11: Oscillation amplitude sensor menu

##### 4.2.9.1 Oscillation amplitude sensor function

For this procedure, it is assumed that the parameters for the oscillating conveyor are correctly set.

##### Procedure:

1. Switch off FS-16/FS-18 power output with the OFF button.
2. Connect the oscillation amplitude sensor from the company FFM (article designation SWS-01) to the FS-16/FS-18.
3. In the oscillation amplitude sensor menu, select the corresponding channel 1.
4. Switch on the FS-16/FS-18 power output with the ON button.
5. On the user level of the selected channel, set the nominal capacity and confirm with the "SET" button.

The SW sensor now regulates to the specified nominal capacity. If this is to be changed, the procedure should be executed again starting with step 5. When the control range is exceeded, this is displayed under "Status 2" of the SW sensor.

<b>ATTENTION</b>	In software version 1.0, only possible via internal setpoint specification.
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#### 4.2.10 Piece counter menu

The following Table 12 shows the structure.


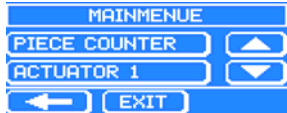

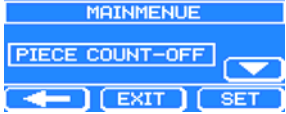
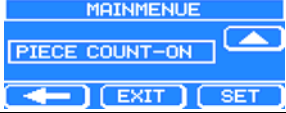


Screen display	Button	Screen display
	MENU	Press the MENU button.
	PIECE COUNTER	Press the ▽ button until "PIECE COUNTER" appears.
	Status (STATUS)	 Switch off piece counter
		 Switch on piece counter
	Reset (TOTAL RESET)	 All piece counters are reset.

Table 12 Piece counter menu

#### 4.2.11 Actuator menu

The following Table 13 shows the structure.



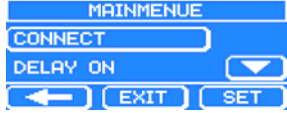
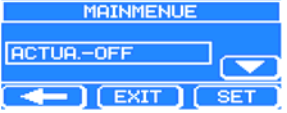
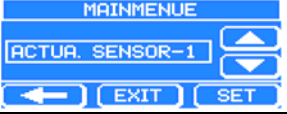


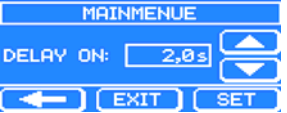
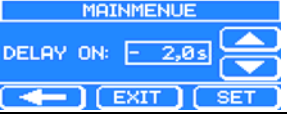
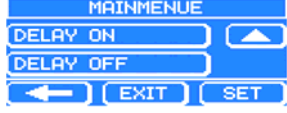
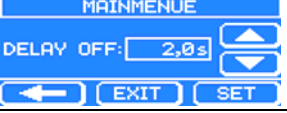
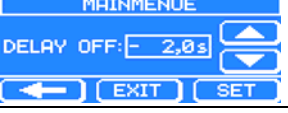
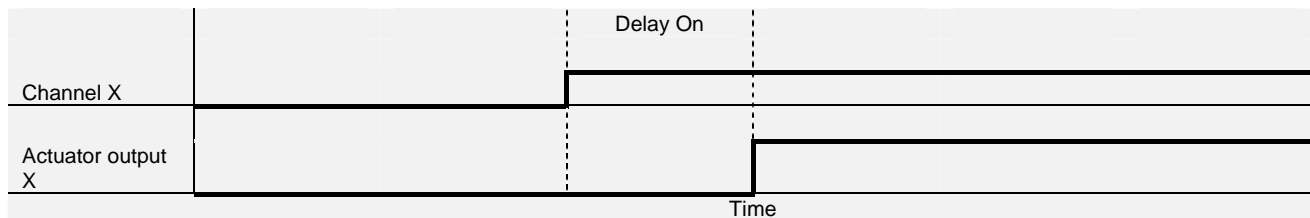
Screen display	Button	Screen display
	MENU	Press the MENU button.
	ACTUATOR 1	Press ▽ button until "ACTUATOR 1" appears. Select the desired actuator
	Link (CONNECT)	 Off delay setting (setting range 0.0 s – 60.0 s)
		 Link actuator output X to sensor 1. Actuator output becomes active/inactive when set delay times of sensor 1 have elapsed.
		 Link actuator output to channel 1. Actuator output becomes active when channel 1 is active and inactive when channel 1 is switched off.
	Time delay (DELAY ON)	 Actuator output switch-on delay. Actuator output becomes active after 2 s when channel X is switched on.
		 Actuator output switch-on delay. Actuator output is active for 2 s before channel X is switched on.
	Time delay (DELAY OFF)	 Actuator output switch-off delay. Actuator output is active for 2 more seconds after switching off channel X.
		 Actuator output switch-off delay. Actuator output switches off 2 seconds before channel X is switched off.

Table 13: Actuator menu

The time delays for the actuator outputs can only be used if there is a link to an output channel (CHANNEL X).

The following diagrams show the various switch-on/switch-off delays for the actuator outputs.

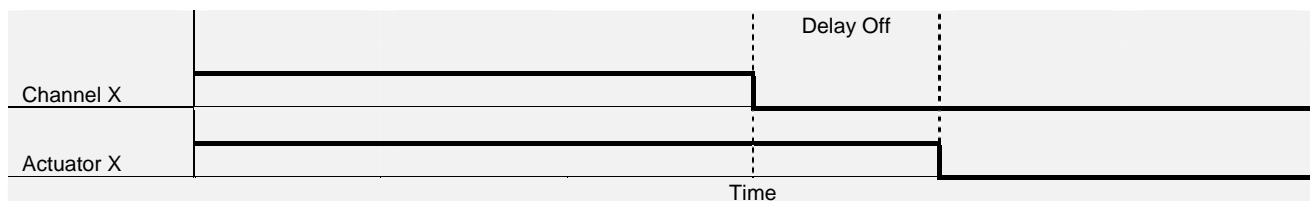
Setting: Delay On > 0 s



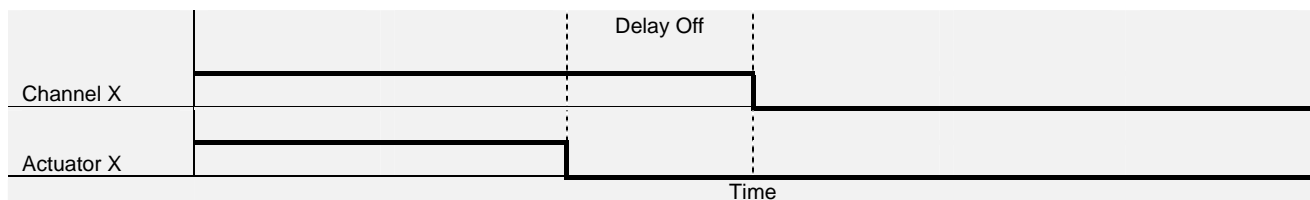
Setting: Delay On < 0 s



Setting: Delay Off > 0 s

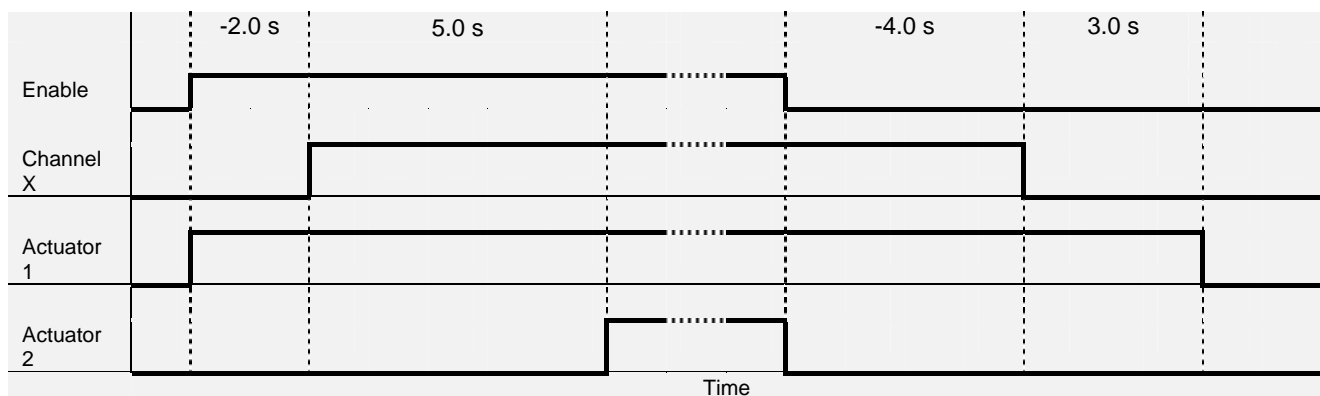


Setting: Delay Off < 0 s



If both actuator outputs are linked to the same channel X, the delay times are executed as follows.

Setting: **Actuator 1:** Delay On -2.0 s Delay Off 3.0 s **Actuator 2:** Delay On 5.0 s Delay Off -4.0 s



#### 4.2.12 Enable menu

The following Table 13 shows the structure.




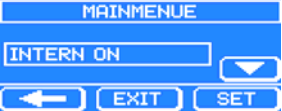
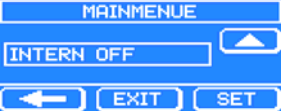

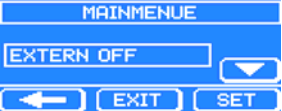
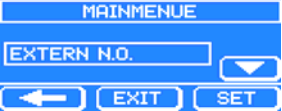





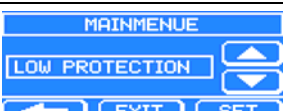

Screen display	Button	Screen display
	MENU	Press the MENU button.
	Enable (ENABLE)	Press ▽ button until "ENABLE" appears.
	Internal enable (ENABLE INTERN)	 Activate internal enable.
		 Deactivate internal enable.
	External enable (ENABLE EXTERN)	 Deactivate external enable
		 External enable, switching status N.O. "normally open", active when contact closed
		 External enable, switching status N.C. "normally closed", active when contact open

Table 14: Enable menu

#### 4.2.13 Password menu

The following Table 15 shows the structure.

Screen display	Button	Screen display
	MENU	Press the MENU button.
	PASSWORD <sup>1</sup>	Press the ▽ button until "PASSWORD" appears.
	Password not active (PASSWORD OFF)	 If the FS-16/FS-18 has password protection, this must be entered to deactivate. LOW PROTECTION: <b>7951</b> HIGH PROTECTION: <b>6842</b>
	Low password protection (LOW PROTECTION)	 LOW PROTECTION protects all input parameters, such as power, etc. The ON/OFF function is not protected with this type of protection. Password for LOW PROTECTION:




Screen display	Button	Screen display
		<b>7951</b>
	High password protection (HIGH PROTECTION)	 HIGH PROTECTION - all inputs to the device are protected. Password for HIGH PROTECTION <b>6842</b>
	STATUS: LOGGED	This is displayed when the password has been correctly input. As long as one is logged in, there will be no password query.

Table 15: Password menu

### Note regarding password protection

Password protection active:

Before changing input parameters, the password must be entered according to the type of protection. A correctly entered password is active for two minutes after the last press of a button.

#### 4.2.14 Channel menu (CHANNEL MENU 1 / CHANNEL MENU 2<sup>\*1</sup> / CHANNEL MENU 3<sup>\*2</sup>)

The channel menus for power output 1 (CH1), power output 2 (CH2)<sup>\*1</sup>, power output 3 (CH3)<sup>\*2</sup> have the same structure. The following Table 16 shows the structure.











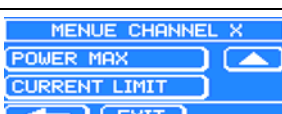
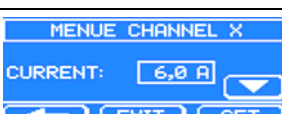

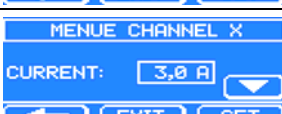
Screen display	Button	Screen display
	MENU	Press the MENU button.
	Set ramp (SET RAMP)	For branching to the ramp menu, see section 4.2.15
	Type of setpoint specification for the capacity (POWER INPUT)	 The capacity setpoint is specified via the touchscreen.
		 The capacity setpoint is specified via the analog input. <i>Specification 0-10 V corresponds to 0-100%.</i>
		 The capacity setpoint is specified via the analog input. <i>Specification 4-20 mA corresponds to 0-100%.</i>
	Setpoint specification, power 2 (POWER 2)	 Setting the setpoint specification for capacity 2. <i>(setting range 0-100%).</i>
	Output limit (POWER MAX)	 Setting the maximum capacity. <i>(setting range 0-100%).</i>
	Current limit (CURRENT LIMIT)	 Setting for the maximum current on channel 1 <i>(setting range 1.0-6.0 A).</i>
		 Setting for the maximum current on channel 2 <i>(setting range 1.0-3.0 A).<sup>*1</sup></i>
		 Setting for the maximum current on channel 2 <i>(setting range 1.0-3.0 A).<sup>*2</sup></i>

Table 16: Channel menu



### 4.2.15 Ramp menu





Screen display	Button	Screen display
	Soft start ramp (SOFT START)	 Soft start ramp setting. (setting range 0.1 s – 10.0 s).
	Soft stop ramp (SOFT STOP)	 Soft stop ramp setting. (setting range 0.1 s – 10.0 s).

Table 17: Ramp menu

## 4.3 Error display

Description of the errors shown on the screen.

### 4.3.1 Overtemperature


Screen display	Screen description
	<p>When the maximum permissible temperature of the FS-18/FS-16 is exceeded, this is displayed on the screen.</p> <p>In the status bar, "ERR: OVERHEAT" will appear.</p> <p>In addition, the current temperature is schematically displayed via a white bar. Once the temperature is in the normal range (white bar gone), the previous operation is continued.</p>

Table 18: Overtemperature error

### 4.3.2 Current limit

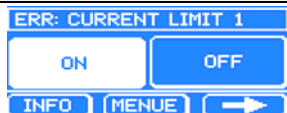
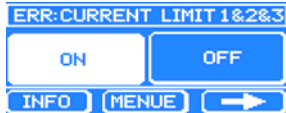
Screen display	Screen description
	<p>If the current is exceeded at the channel output, the respective display appears in the status bar:</p> <p>"ERR: CURRENT LIMIT 1". Channel output 1 is at the current limit.</p> <p>"ERR: CURRENT LIMIT 2". Channel output 2 is at the current limit.<sup>*1</sup></p> <p>"ERR: CURRENT LIMIT 3". Channel output 3 is at the current limit.<sup>*2</sup></p> <p>"ERR: CURRENT LIMIT 1&amp;2". Channel outputs 1 and 2 are at the current limit<sup>*1</sup></p> <p>"ERR: CURRENT LIMIT 1&amp;3". Channel outputs 1 and 3 are at the current limit<sup>*2</sup></p> <p>"ERR: CURRENT LIMIT 2&amp;3". Channel outputs 2 and 3 are at the current limit<sup>*2</sup></p> <p>"ERR: CURRENT LIMIT 1&amp;2&amp;3". Channel outputs 1, 2 and 3 are at the current limit<sup>*2</sup></p>
	

Table 19: Current limit error

### 4.3.3 No SW sensor connected

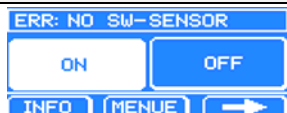
Screen display	Screen description
	<p>"ERR: NO SW SENSOR" is displayed when no SW sensor is detected at the input.</p> <p>Cause of error:</p> <ul style="list-style-type: none"> <li>– No sensor connected.</li> <li>– Cable breakage.</li> <li>– Defective sensor.</li> </ul>

Table 20: SW sensor error

### 4.3.4 Current supply interruption


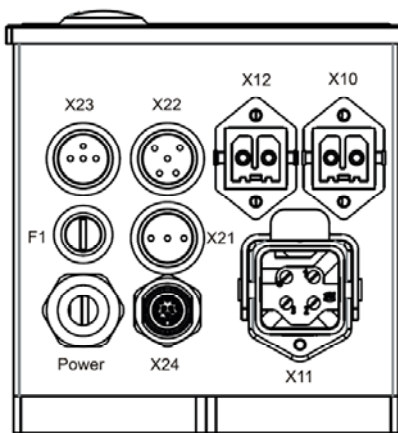
Screen display	Screen description
	<p>This screen appears if the current supply to the FS-16/FS-18 is interrupted (e.g. due to a power failure or switching off the power supply). The FS-16/FS-18 switches off the power output (Channel 1) (Channel 2<sup>*1</sup>) and (Channel 2<sup>*2</sup>) in this state. The last operating state is saved and is continued when the voltage supply is switched on.</p>

Table 21: Current supply interruption error

## 5 Description of control I/Os, FS-16 / FS-18



Plug connection	Designation	
X21	Enable	1: +24 V DC 2: Signal
X22	Sensor	1: +24 V DC 2: 0 V 4: Signal
X23	Operation status output	1: N.O. 2: Changer 3: N.C.
X24	Actuator / SWS	1: +24 V DC 2: Actuator output 3: 0 V 4: SW sensor
X12	Actuator 230 V AC "FS-18 only"	1: 230 V AC 2: 0 V

### 5.1 Operating status

The operating output is designed as a potential-free changeover contact with a maximum loadability of 230 V AC / 6 A.

### 5.2 Enable input

The enable input is for switching the oscillating conveyor connected to the FS-16 / FS-18 on and off without power. The enable must be designed via a potential-free contact. (e.g.: external switch)

### 5.3 Sensor input

The load output of the FS-16 / FS-18 can be switched on/off via a sensor, e.g. filling level sensor. Via the global menu, the on and off delay times can be set within a range between 0 – 60 sec. The resolution is 0.1 seconds. In the following Figure 3, the time curve is shown graphically.

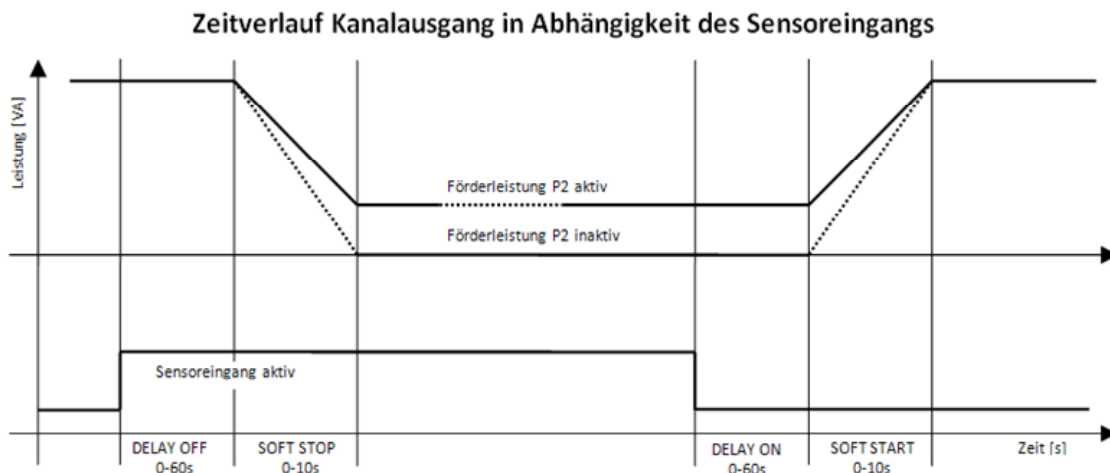


Figure 3: Time curve for load output, sensor input

### 5.4 SW sensor input

The oscillation amplitude sensor input of the FS-16 / FS-18 is also connected to input X24. For the function, see section 4.2.9 Main menu, SW SENSOR.

## 5.5 Actuator output

The actuator output of the FS-16 / FS-18 is a digital output, which is freely selectable. See section 4.2.7 Main menu ACTUATOR.

The output has a voltage of +24 V and a load current of max. 700 mA. The output is short-circuit proof. A constant overload should be avoided, however.

0 V means that the actuator output is switched off.

+24 V means that the actuator output is switched on.

The FS-18 has a separate actuator output with 230 V AC / 3 A.

## 6 Technical data

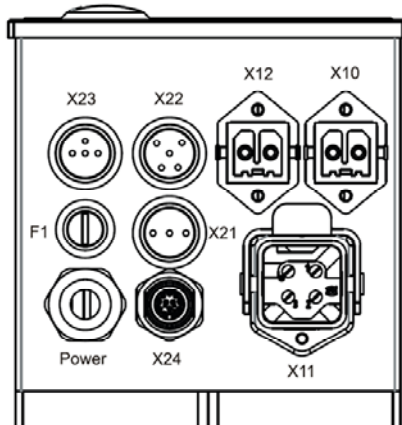
Supply voltage:	230 V AC / 115 V AC (other voltages possible after consultation)
Supply voltage tolerance:	± 10 %
Mains frequency:	50/60 Hz (other frequencies possible after consultation)
Output current (CH1) FS-16	6 A
Output current (CH1) FS-18	8 A
Output voltage:	0 ... 210 V
Enable	Contact 24 V DC
Load current, sensor 1:	24 V DC each, max. 100 mA
Load current, actuator	24 V DC each, max. 700 mA (FS-18 230 V AC, max. 3 A)
Status output, potential-free changeover contact	Changeover contact, 230 V AC / 6 A
Operation:	Touchscreen
Display:	LCD display, 128x64 pixels
Type of protection:	IP54
Permissible ambient temperature	5°C to 45°C
Permissible relative humidity	max. 95 %, non-condensing.
Dimensions:	approx. (h)185 mm x (w)109 mm x (d)115 mm
EMC	Interference emissions and noise immunity in acc. with <b>EN 61000-6-x</b>  Noise immunity in acc. with <b>EN 61000-4-x</b> Electrostatic discharge strength (ESD) <b>IEC / EN 61000-4-2</b> HF irradiation <b>IEC / EN 61000-4-3</b> ("Burst") <b>IEC / EN 61000-4-4</b> ("Surge") <b>IEC / EN 61000-4-5</b> HF current infeed <b>IEC / EN 61000-4-6</b> Voltage drop, voltage interruption <b>IEC / EN 61000-4-11</b>

## 7 Terminal assignments

### ATTENTION

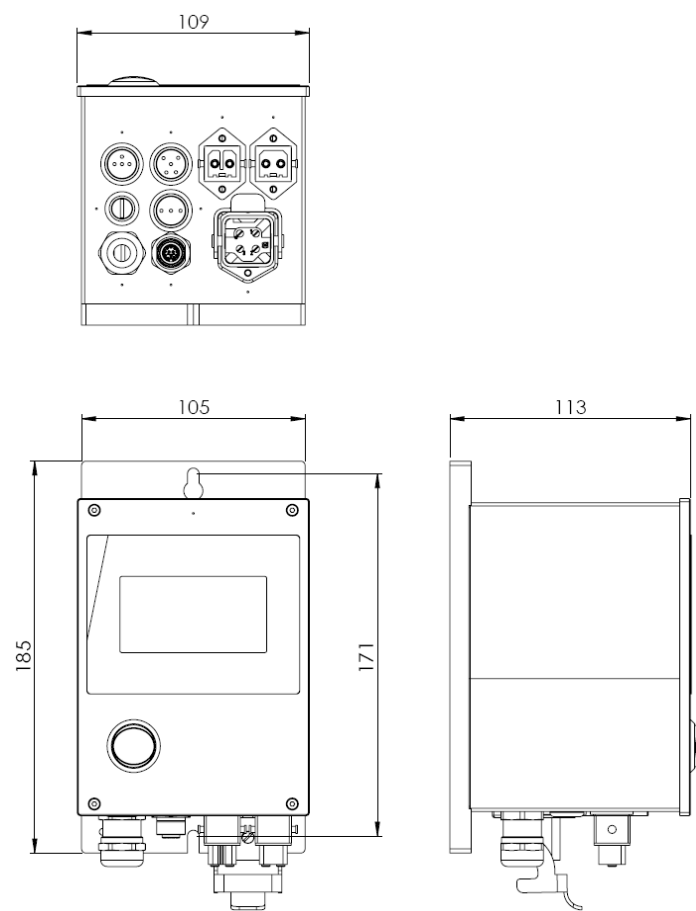
If the device is not correctly connected, this can lead to the failure or complete destruction of the device (and the connected load).

### 7.1 Power connection assignments



Plug connection	Designation	
Power	Supply voltage	115 V AC...230 V AC 50 Hz / 60 Hz
X10	Mains output	1: 230 V AC 2: 0 V PE: PE
X11	Consumer output	1: Load 2: Load PE: Protective ground conductor
F1	Fuse	6.3 A, slow-blow

## 8 Dimensions



## 9 Maintenance and care

### 9.1 Regular tests

The devices are usually maintenance-free. The electrical equipment of the machines are still to be checked regularly by skilled electricians.

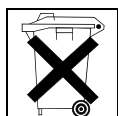
If it's dirty, clean the touchscreen with a conventional window cleaner and a soft, lint-free cloth.

### 9.2 Decommissioning and disposal

The device is to be decommissioned by skilled electrical personnel while complying with the valid safety regulations.

The packaging of the converter can be recycled. Please keep the packaging for later use.

Easily removable screw connections allow the device to be disassembled into its components. These individual components can be recycled. Please carry out disposal in agreement with the local regulations.



Problematic materials must not be thrown away in the normal waste!  
Dispose of problematic materials properly, safely and in an environmentally-friendly manner.

## 10 Accessories and options

### 10.1 The plug connectors listed below are available as accessories:

Function	Slot	Article number
• Mains output connection	X10	91.3300.20
• Enable/disable connection	X21	91.3300.70
• Filling level sensor connection	X22	91.3300.40
• Operating status output connection	X23	91.3200.60
• Actuator connection, 230 V (FS-18 only)	X12	91.3300.30

### 10.2 The connection lines and oscillation amplitude sensor listed below are available as accessories:

Function	Length, line	Slot	Article number
• Vibration conveyor connection	1.5 m	X11	91.4301.20
• Vibration conveyor connection	3 m	X11	91.4301.00
• Vibration conveyor connection	5 m	X11	91.4301.10
• Connection of a filling level sensor	3 m, straight plug	X22	91.4210.01
• Connection of a filling level sensor	5 m, straight plug	X22	91.4210.02
• Connection of a filling level sensor	3 m, angled plug	X22	91.4210.03
• Connection of a filling level sensor	5 m, angled plug	X22	91.4210.04
• Connection of a level sensor	3 m, angled plug	X22	91.4201.03
• Connection of a level sensor	5 m, angled plug	X22	91.4201.04
• Disable connection to a TSM-11 control	3 m	X23	91.4280.01
• Disable connection to a FSM-137 control or FS-16 / FS-18 / TD-16 control unit	3 m	X23	91.4280.02
• Disable connection to a FSM-137 control or FS-16 / FS-18 / TD-16 control unit	5 m	X23	91.4280.03
• Disable connection to a FSM-137 control or FS-16 / FS-18 / TD-16 control unit	0.3 m	X23	91.4280.04
• Connection of an oscillation amplitude sensor, SWS-01		X24	90.1130.03
• Connection of a sorting air valve 24 V	3 m, angled socket	X24	91.4220.03
• Y piece for connecting an oscillation amplitude sensor in combination with sorting air, 24 V		X24	91.3900.02
• Connection Sorting air valve 230 V FS-18 only	3 m, Festo MSUDK CB5K	X	91.4220.01
• Connection Sorting air valve 230 V FS-18 only	3 m Festo MSUDK IB5K	X	91.4220.02